CLAIMS: Clean Copy

1. A method of processing a mineral composition comprising a refractory material the method comprising milling the composition to a particle size of P_{80} of less than 25 microns and leaching said composition with a solution comprising lime and/or limestone in the presence of an oxygen containing gas.

2. The method of claim 1, wherein the refractory material is selected from the group comprising an iron containing sulfide ore, a refinery slime, a carbonaceous ore, a selenide and a telluride.

3. The method of claim 1, wherein the refractory material is selected from the group consisting of pyrite, marcasite, arsenopyrite, troilite, pyrrhotite stibnite, tetrahedrite, argentopyrite, calaverite, altaite, gold bearing selenides, tennantite and pentlandite.

4. (Amended) The method of claim 3, wherein the refractory material is pyrite or arsenopyrite.

5. The method of claim 2, wherein the material is leached at atmospheric pressure.

6. The method of claim 5 wherein the material is leached in an open tank reactor.

7. The method of claim 2, wherein the material is leached at a temperature of about 50°C up to about the boiling point of the solution.

8. The method of claim 5, wherein the oxygen containing gas is oxygen and the oxygen is introduced into the leaching solution to a level of between about 200 to about 1000kg/tonne of solids in the leaching solution.

9. The method of claim 8, wherein the oxygen is introduced into the leaching solution at a flow rate of between about 0.1 to about 0.5vvm.

10. The method of claim 1, wherein the particle size is between about 2 to about 25 microns.

11. The method of claim 1, wherein the particle size is between about 5 to about 15 microns.

12. The method of claim 1, wherein the solution has a pH of the solution is between about 6 to about 12.

13. The method of claim 1, wherein the solution has a pH of between about 6 to about 9.

14. The method of claim 13, wherein the leach solution comprises a mixture of lime and limestone and wt% of limestone in the mixture is between about 40 to about 95%.

15. The method of claim 14, wherein the amount of lime and/or limestone added to the leach solution is between about 100 to about 1200kg/tonne of solids in the solution.

16. The method of claim 15, wherein the amount is about 800kg/tonne.

17. A method of recovering precious metals from a mineral composition comprising a refractory material, the method comprising:

grinding the material to a particle size of 80% passing 25μm or less;

leaching the ground material in the presence of lime and/or limestone and an oxygen containing gas; and

subjecting the leached material to a further leaching step to recover any precious metals.

18. The method of claim 17, wherein the refractory material is a refractory sulfide material bearing gold, silver or platinum.

19. The method of claim 17, wherein the refractory material includes a carbonaceous fraction.

20. The method of claim 17, wherein lime and/or limestone is added to a level of between about 100 to about 1200kg/tonne of solids ion the leaching solution and oxygen is introduced to a level of between about 200 to about 1000kg/tonne of solids in the leaching solution.

21. The method of claim 17, wherein the further leaching step uses cyanide as a lixivant.

22. Gold, silver or platinum recovered by the method of claim 18.

23. A method of recovering gold from a refractory material having a carbonaceous fraction, the method comprising grinding the ore to a particle size of 80% passing 25 micron or less, leaching the ground material with a solution comprising lime and/or limestone at a pH of between about 6 to about 12 in the presence of an oxygen containing gas, subjecting the leached material to a further leaching step in the presence of a cyanide and recovering gold from the cyanide leachate.

24. Gold recovered by the method of claim 23.